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TW5210
GPS Receiver/Antenna
User Manual

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Rev 1-1	29 August 2011	Added 12V RS232 version
Rev 1_2	11 Oct 2011	Changed part numbers

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1 Introduction

The TW5210 is an integrated GPS receiver/antennas designed for use in professional grade applications such as vehicle tracking.

It features the STMicroelectronics STA8058 Teseo™ WAAS, EGNOS and MSAS enabled GPS receiver IC, a high performance low noise amplifier stage, a tight out-of-band SAW filter to reject interference, and a perfectly tuned antenna element for maximum GPS signal reception, even in dense urban-canyon environments where multipath interference is prevalent.

The TW5210 is available with brick-wall filter option to eliminate possible interference from Lightsquared transmissions.

Figure 1 TW5210

The TW5210 is housed in a compact, industrial-grade weather-proof, magnet mount enclosure, with a NMEA 0183 standard output via a RS232 or CMOS interface on flying leads, or a USB connector.

A GPS position fix is obtained in less than 39 seconds from a cold start, and recovery from temporary blockage of GPS signal is typically less than 1 second.

The TW5210 periodically stores the last know position in non-volatile memory to maintain position information across power cycles.

1.1 Ordering Information

TW5210 with 3 metre cable, NMEA & 1PPS output, RS232 interface, RJ14 connector	32-5210-0
TW5210 with 3 metre cable, NMEA output, USB Connection	32-5210-1
TW5210 with 3 metre cable, NMEA output, 5V RS232 interface, RJ14 connector	32-5210-2

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Features

- Integrated GPS receiver, GPS antenna, LNA & SAW filter in one
- STMicroelectronics STA8058 Teseo™ GPS L1 Receiver IC
- SBAS: WAAS, EGNOS & MSAS enabled
- Very high Carrier to Noise Ratio (C/No)
- 1 pulse per second source (RS232 version)
- UTC synchronized precise time-base
- GPS output: NMEA 0183
- RS232, USB and CMOS interface options
- Industrial grade waterproof IP67 enclosure
- RoHS Compliant

2 TW5210 Evaluation

The TW5210 hardware is shipped with a software package, Part # 45-0016-0 which includes the following:

- TW5210 User manual
- USB Driver (for USB version only)
- TW5X10 Configurator application

2.1 Configurator

Tallysman provides a Windows based Configurator application (Part # 42-0004-0) to configure the operating parameters of the TW5XXX. See section 5 for configuration parameter details

2.2 Open Source GPS Software Utility

The TW5210 is compatible with most third party applications that are capable of decoding standard NMEA 0183 messages.

The following open source GPS utility can be used to display the NMEA output sentences graphically.

http://www.visualgps.net/VisualGPS/

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3 TW5210 Output

GPS position information is output once per second in NMEA format.

The default output from the TW5210 is RMC, GGA, VTG, and GSA messages.

The TW5210 can be configured to output the following NMEA sentences using the Tallysman TW5XXX Configurator:

- RMC - The RMC message is the recommended minimum data for GPS
- GGA - The GGA message provides GPS Fix Information
- VTG - The VTG message provides vector track and speed over ground
- GSA - The GSA message provides overall satellite data
- GSV - The GSV message provides detailed satellite data.

The RMC and GGA message can be configured as 3, 4 or 5 digit output, the default is 5

Note 1: If you are using the Visual GPS software utility to display TW5210 outputs, the GSV message should be enabled to view satellite signal strengths.

Note2: For interfacing to Tait Radio's set the RMC and GGA digits to 3

3.1 Baud Rate

The TW5210 baud rate is configurable from 4800 bps to 115kbps. The default baud rate is 4800 baud.

When using the USB version the baud rate is not applicable.

3.2 Satellite Based Augmentation System (SBAS)

The TW5210 can be configured to use satellite corrections transmitted by SBAS satellites to provide greater positioning accuracy.

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There are three compatible SBAS systems which are integrated to provide a seamless worldwide navigation system. The following are valid SBAS satellite ID's

Configure the SBAS satellite ID closest to your Location see Table 1 below

Satellite Name	NMEA	Satellite ID (PRN)	Location
Inmartsat 4F3	46	133	98° W
Galaxy 15	48	135	133° W
Anik F1R	51	138	107.3° W
Inmarsat	33	120	15.5° W
ARTEMIS	37	124	21.5° E (Test)
Inmarsat 4-F2	39	126	25° E
Inmarsat 3-F1	44	131	64.5° E
MTSAT-1R	42	129	140° E
MTSAT-2	50	137	145° E

Table 1

The default satellite ID is 133 (Suitable for longitudes of those of the Eastern US).

For more information on SBAS satellite see:

http://en.wikipedia.org/wiki/WAAS

http://en.wikipedia.org/wiki/European_Geostationary_Navigation_Overlay_Service

4 TW5210 Installation

For best results the TW5210 GPS Receiver/Antenna should installed with a clear view of the sky. The GPS Receiver/Antenna will obtain a 3D fix GPS fix with a minimum of 4 satellites.

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5 TW5X10 Configurator

Tallysman provides a Windows based Configurator application (Part # 42-0004-0) for configuration of the TW5210 operating parameters. Figure 2 shows the TW5210 default configuration.

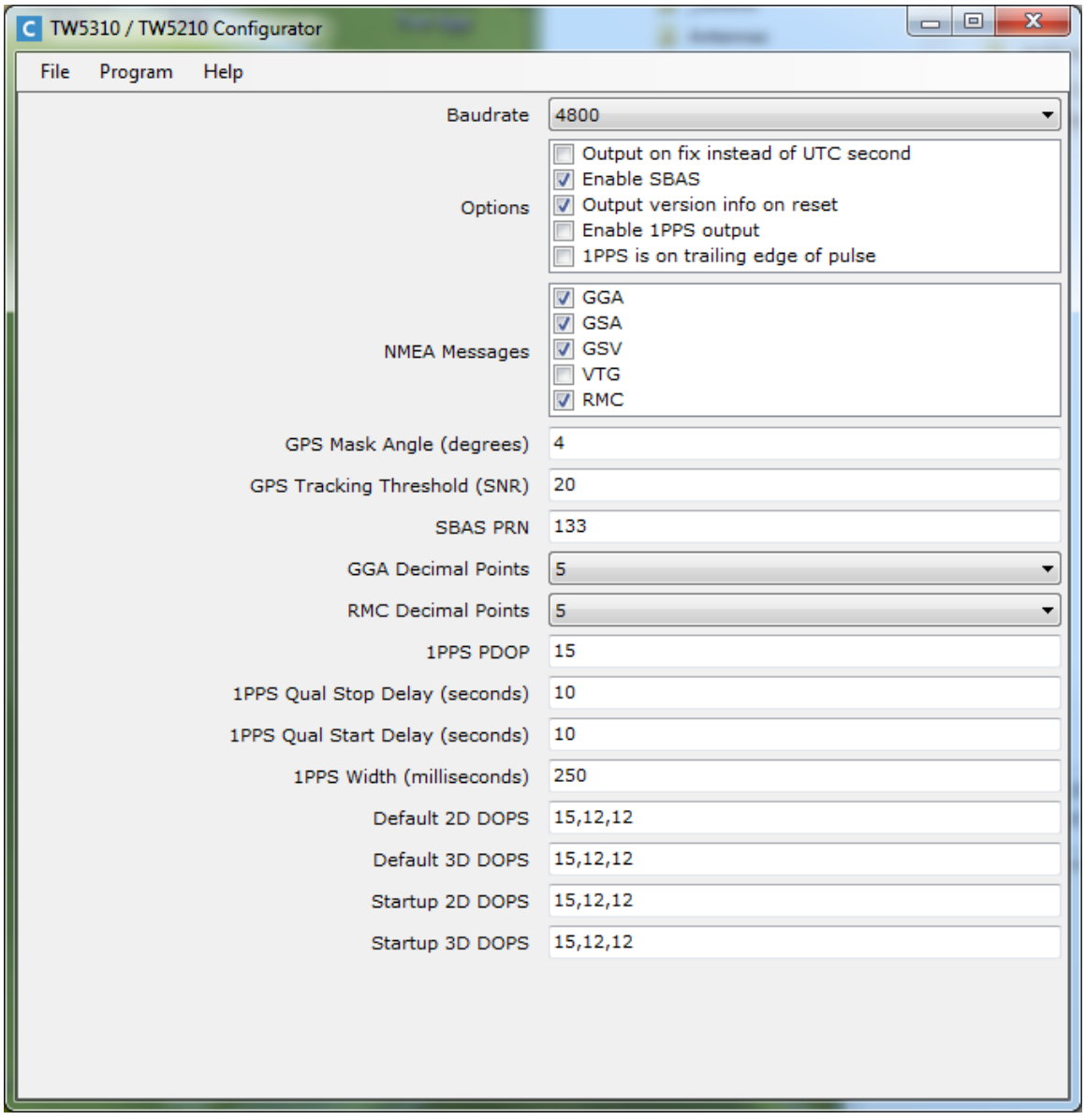

Figure 2

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5.1 Parameter Fields

The following configuration parameters can be set and saved:

Baud rate: Not applicable for the TW5210 USB version. Leave as default 4800 baud

Options:

Output on fix instead of UTC second:

The TW5210 will immediately output NMEA sentences on acquiring a fix

Enable SBAS:

When set and if data is currently received from an SBAS satellite, the TW5210 includes the SBAS corrections in the calculated position.

Output version info on reset:

The TW5210 will outputs its firmware version on reset

Enable 1PPS output: Not applicable for the TW5210 USB version

1PPS on trailing edge: Not applicable for the TW5210 USB version

NMEA Messages: Select NMEA sentences to be output. The default messages output are RMC GGA, VTG,GSA and GSV.

GPS Mask Angle (degrees) : Sets the subtended elevation angle of a GPS satellite below which its data will be ignored. The default is 4^{o}

GPS Tracking Threshold:

This parameter sets the minimum C/N0 threshold to track a satellite. Any GPS satellite, with C/N0 less than the threshold value is dropped and the GPS engine searches for another satellite with a stronger signal level. Increasing the tracking threshold decreases the GPS sensitivity, but helps prevent errors due to multipath. The value must be in the range 10 to 40.

SBAS PRN: Set the SBAS satellite number to track.

GGA Decimal Digits: Sets the number of decimal digits output for lat and long. The default is 5 but can be changed to 3 or 4

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RMC Decimal Digits: Sets the number of decimal digits output for lat and long. The default is 5 but can be changed to 3 or 4

1PPS DOP: Not applicable for the TW5210 USB version

1PPS Qual Stop Delay: Not applicable for the TW5210 USB version

1PPS Qual Start Delay: Not applicable for the TW5210 USB version

1PPS Width: Not applicable for the TW5210 USB version.

Default 2D DOPS: These are the maximum allowable values for calculating a 2D fix. The default values for PDOP, VDOP, HDOP are 15,12,12

Default 3D DOPS: These are the maximum allowable values for calculating a 3D fix. The default values for PDOP, VDOP, HDOP are 15,12,12

Startup 2D DOPS: Set these values the same as the default 2D DOPS

Startup 3D DOPs: Set these values the same as the default 3D DOPS

5.2 Read/Write

Select **Program/Read** to read the parameters in the TW5210

To write a new set of parameters to the TW5210 select **Program/Write**

The configuration file can be save by selecting **File/Save**

Note: Configuration parameters changes do not take effect until the TW5310 is reset i.e. power cycled.

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6 USB Version

6.1 Installation of USB Drivers

If you are running Windows 7 or Vista and do not have an internet connection on your PC, DO NOT connect the TW5210 to your PC until after the USB driver is loaded

If you are running Windows XP go to section6.1.2 for installation details.

If your PC has an internet connection and you are running Windows 7 or Vista

- Plug the TW5210 into the PC
- Windows will automatically locate the appropriate USB driver and install it

You can verify the installation by going the “Device Manager” and checking the STMicoelectronics driver is loaded. Make a note of the COM port #, see Figure 3, you will need the COM port # when connecting to a GPS test application or the TW5210 configurator.

To get to the Device manger goto - Control Panel\System and Security\System and Select Device Manager.

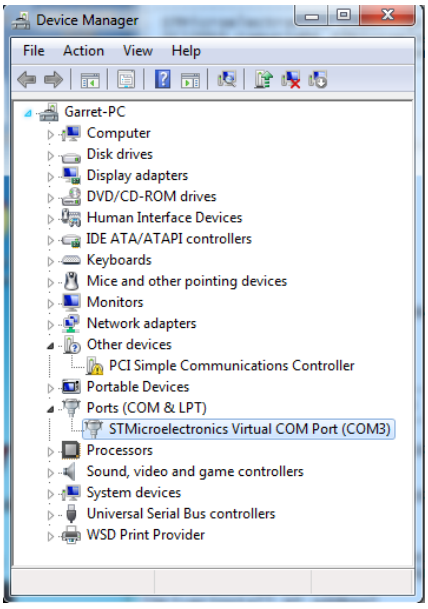

Figure 3

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6.1.1 Windows 7 & Vista Installation

If you do not have an internet connection, install the driver provided in the TW5210 Package i.e. stmcdc_twi file to a location on your PC.

Goto Control Panel\System and Security\System and Select Device Manager.

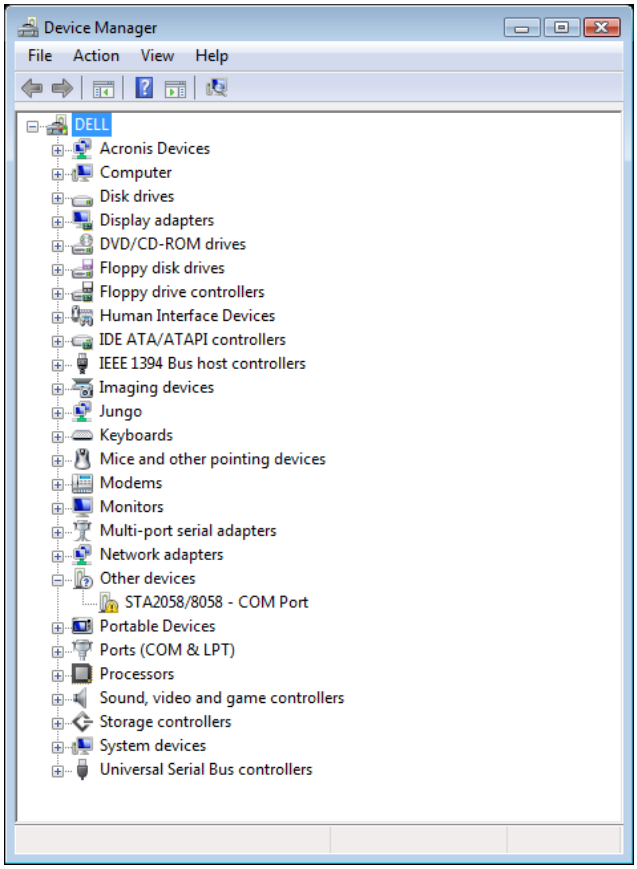

Figure 4

Right click on the top tree selection see Figure 4 “Dell” and select “Add legacy hardware”. The following window will be displayed

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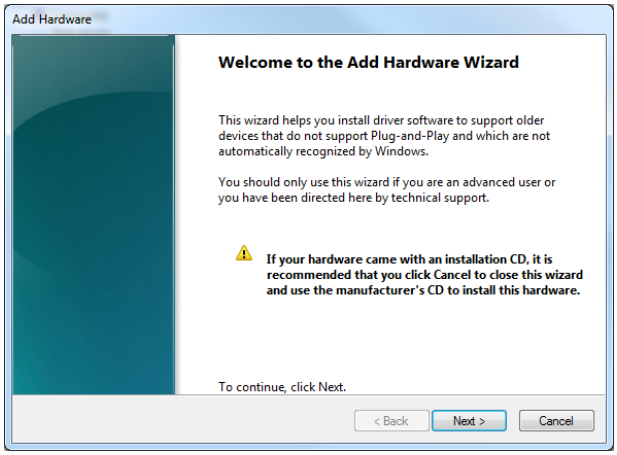
Add Hardware
Welcome to the Add Hardware Wizard
This wizard helps you install driver software to support older devices that do not support Plug-and-Play and which are not automatically recognized by Windows.
You should only use this wizard if you are an advanced user or you have been directed here by technical support.
If your hardware came with an installation CD, it is recommended that you click Cancel to close this wizard and use the manufacturer's CD to install this hardware.
To continue, click Next.
< Back
Next >
Cancel

Figure 5

Select Next

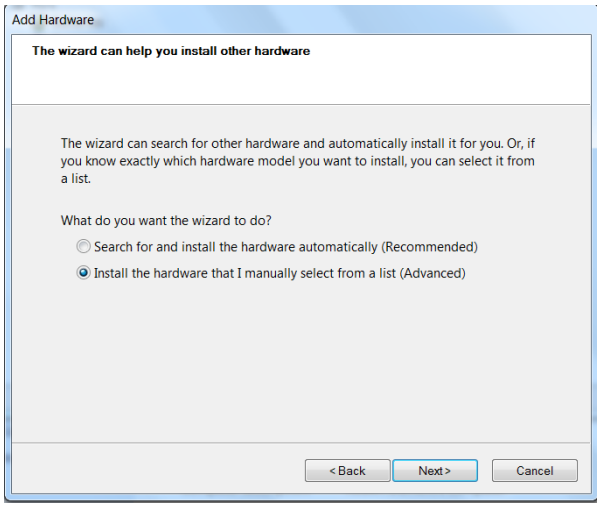
Add Hardware
The wizard can help you install other hardware
The wizard can search for other hardware and automatically install it for you. Or, if you know exactly which hardware model you want to install, you can select it from a list.
What do you want the wizard to do?
Search for and install the hardware automatically (Recommended)
Install the hardware that I manually select from a list (Advanced)
< Back
Next >
Cancel

Figure 6

Select “Install the hardware manually (Advanced)”

Select NEXT

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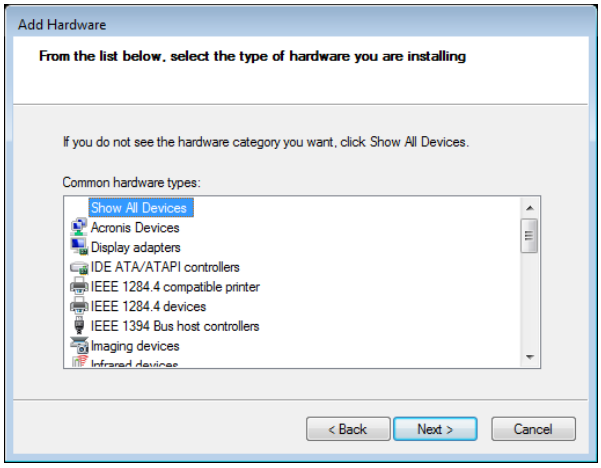
Add Hardware
From the list below, select the type of hardware you are installing
If you do not see the hardware category you want, click Show All Devices.
Common hardware types:
Show All Devices
Acronis Devices
Display adapters
IDE ATA/ATAPI controllers
IEEE 1284.4 compatible printer
IEEE 1284.4 devices
IEEE 1394 Bus host controllers
Imaging devices
< Back
Next >
Cancel

Figure 7

Select Next

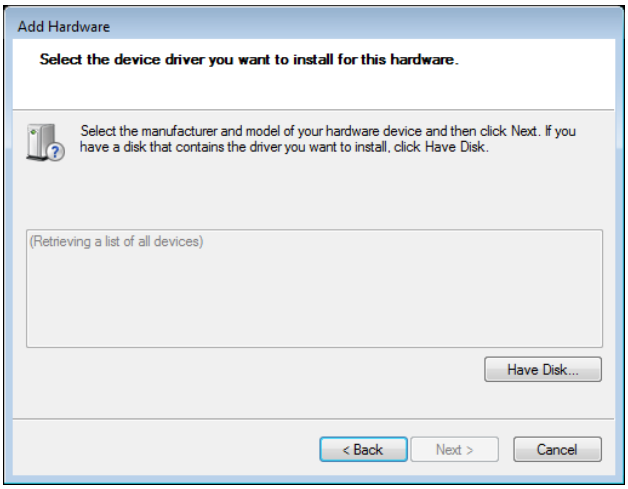
Add Hardware
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
(Retrieving a list of all devices)
Have Disk...
< Back
Next >
Cancel

Figure 8

Select “Have Disk”

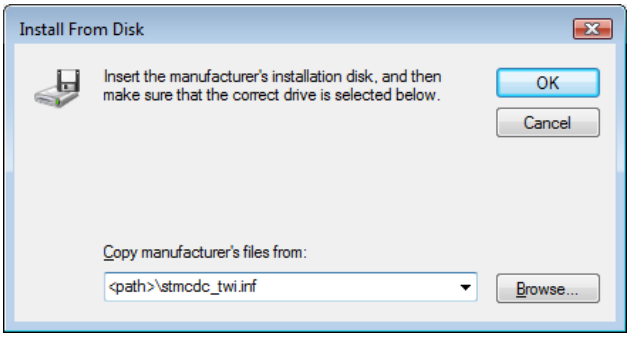

Figure 9

Browse to the location you stored the USB driver and install the driver.

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You will be prompted with the following window:

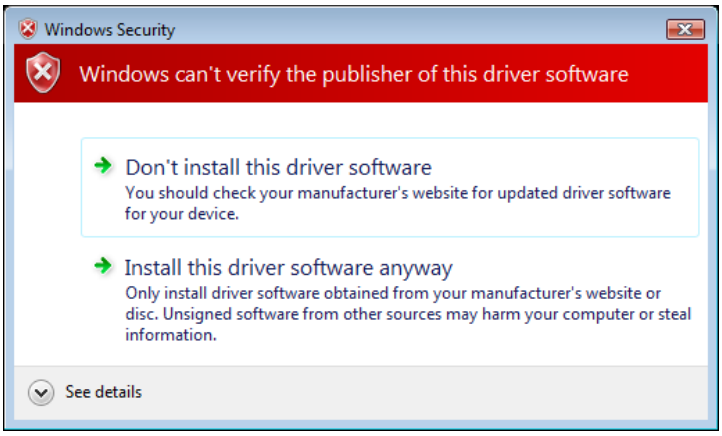
Windows Security
Windows can't verify the publisher of this driver software
Don't install this driver software
You should check your manufacturer's website for updated driver software for your device.
Install this driver software anyway
Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.
See details

Figure 10

Select “Install this driver software anyway”.

You can verify the installation by going the “Device Manager” and checking the STMicoelectronics driver is loaded. Goto Control Panel\System and Security\System and Select Device Manager.

Make a note of the COM port #, see Figure 3, you will need the COM port # when connecting to a GPS test application or the TW5210 configurator.

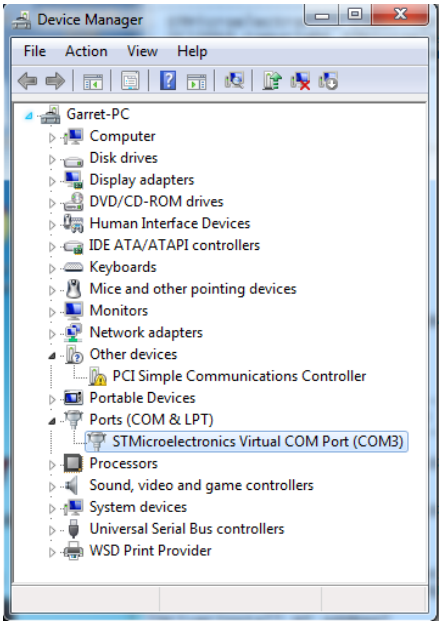

Figure 11

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6.1.2 **Windows XP Installation**

Install the driver provided in the TW5210 Package i.e. stmcdc_twi file to a location on your PC.

Before connecting the TW5012 to your PC goto the Driver Signing.

From the Start menu select Control panel/System/hardware

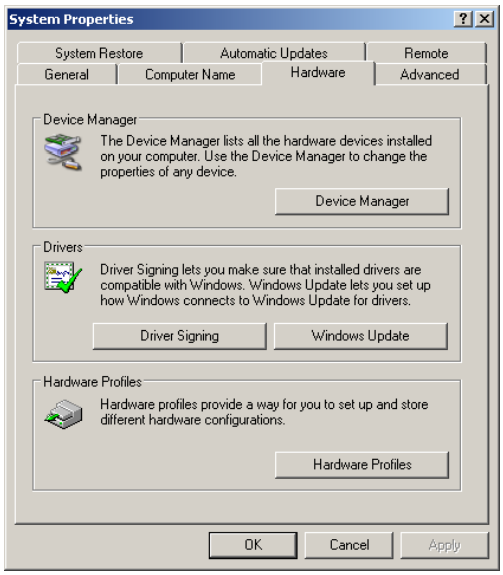
System Properties
System Restore
Automatic Updates
Remote
General
Computer Name
Hardware
Advanced
Device Manager
The Device Manager lists all the hardware devices installed on your computer. Use the Device Manager to change the properties of any device.
Device Manager
Drivers
Driver Signing lets you make sure that installed drivers are compatible with Windows. Windows Update lets you set up how Windows connects to Windows Update for drivers.
Driver Signing
Windows Update
Hardware Profiles
Hardware profiles provide a way for you to set up and store different hardware configurations.
Hardware Profiles
OK
Cancel
Apply

Figure 12

Select “Driver Signing”

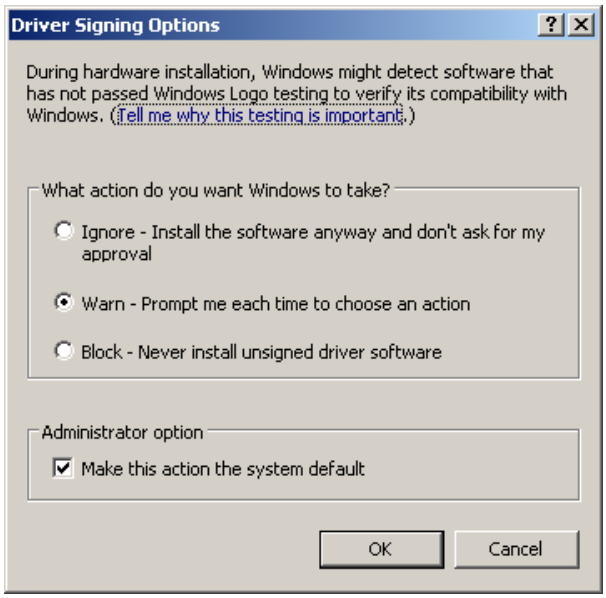
Driver Signing Options
During hardware installation, Windows might detect software that has not passed Windows Logo testing to verify its compatibility with Windows. (Tell me why this testing is important.)
What action do you want Windows to take?
Ignore - Install the software anyway and don't ask for my approval
Warn - Prompt me each time to choose an action
Block - Never install unsigned driver software
Administrator option
Make this action the system default
OK
Cancel

Figure 13

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Check the Warn –Prompt me each time to take an action.

Select OK.

Plug the TW5012 into your computer.

Windows XP will prompt you with a “Found new hardware” wizard.

Check the “No, not this time” box and then press ‘Next”

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

Figure 14

Select “Install from a list or specific location (Advanced)”

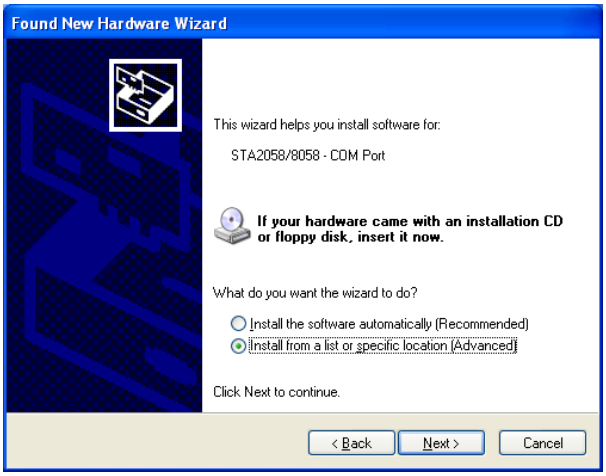
Found New Hardware Wizard
This wizard helps you install software for:
STA2058/8058 - COM Port
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

Figure 15

Check- “Don’t search I will choose the driver to install”

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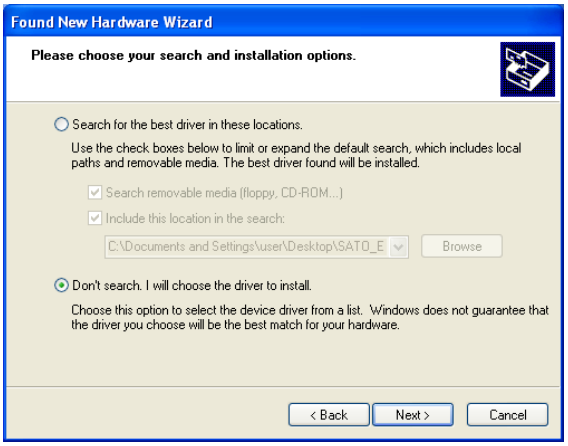
Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
C:\Documents and Settings\user\Desktop\SAT0_E
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

Figure 16

Select “Show All devices”, then Next

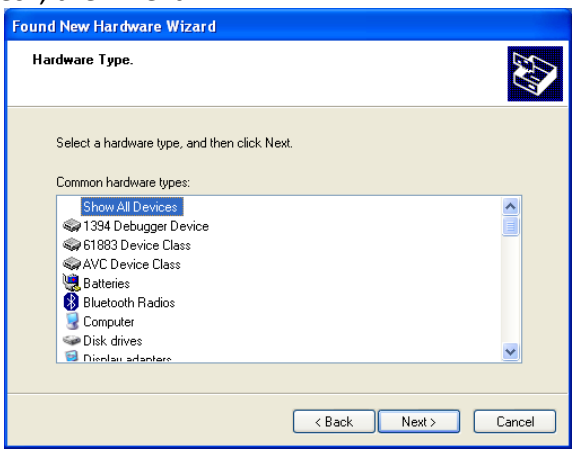

Figure 17

You will be prompted to select a Driver , Select “Have Disk”

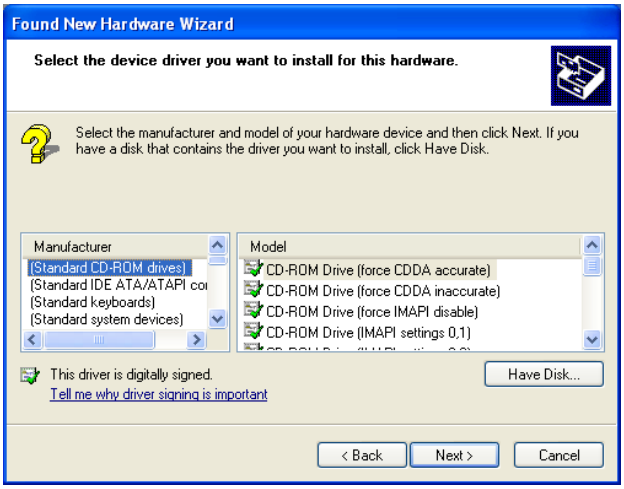
Found New Hardware Wizard
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
Manufacturer
(Standard CD-ROM drives)
(Standard IDE ATA/ATAPI co
(Standard keyboards)
(Standard system devices)
Model
CD-ROM Drive (force CDDA accurate)
CD-ROM Drive (force CDDA inaccurate)
CD-ROM Drive (force IMAPI disable)
CD-ROM Drive (IMAPI settings 0,1)
This driver is digitally signed.
Tell me why driver signing is important
Have Disk...
< Back
Next >
Cancel

Figure 18

Browse to folder the stmcdc_twi driver is installed in

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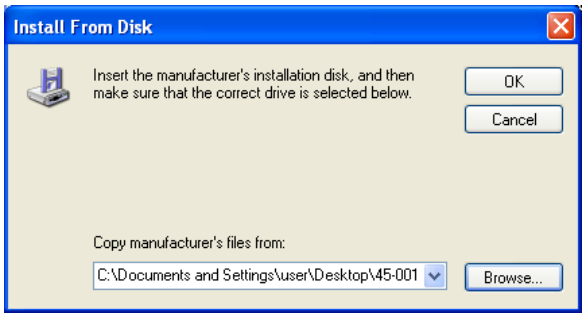
Install From Disk
Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.
OK
Cancel
Copy manufacturer's files from:
C:\Documents and Settings\user\Desktop\45-001
Browse...

Figure 19

The installation will begin and you will be prompted with the following Window:

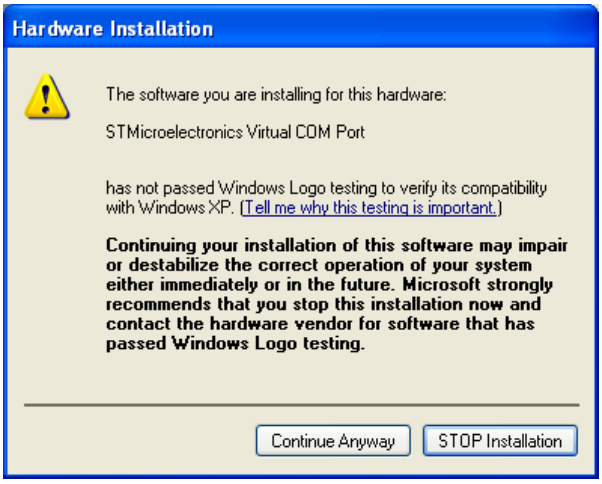
Hardware Installation
The software you are installing for this hardware:
STMicroelectronics Virtual COM Port
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

Figure 20

Select “Continue Anyway”

The installation will continue and will display the following window when complete

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Found New Hardware Wizard
Completing the Found New Hardware Wizard
The wizard has finished installing the software for:
STMicroelectronics Virtual COM Port
Click Finish to close the wizard.
< Back
Finish
Cancel

Figure 21

You can verify the installation by going the "Device Manager" and checking the STMicoelectronics driver is loaded. Goto Control Panel\System and Security\System and Select Device Manager.

Make a note of the COM port #, see Figure 3, you will need the COM port # when connecting to a GPS test application or the TW5210 configurator.

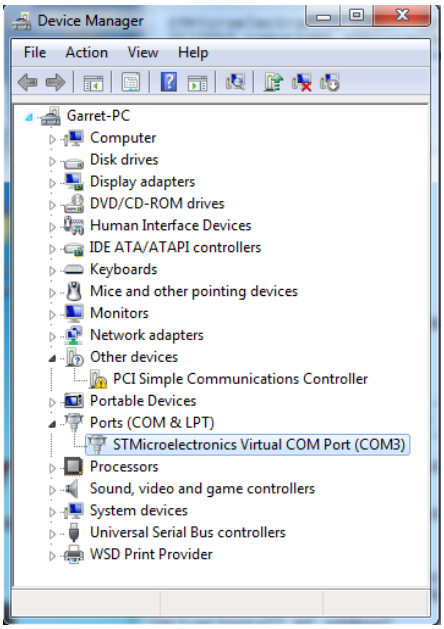

Figure 22

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7 12V RS232 Version

7.1 Interface

The TW5210 RS232 version is terminated in a 4 pin RJ14 connector.

The power input is rated for 12V automotive and has overvoltage and transient protection.

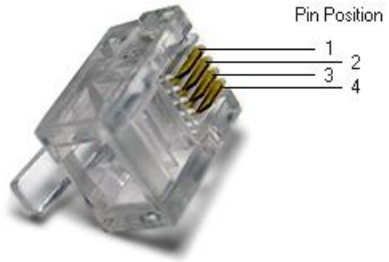

Figure 23

Wire Color	Signal	Comments	RJ14 pin #
Green	RX into the TW5210	RS232 level	1
White	TX out of the TW5210	RS232 level	2
Black	Gnd	0V	3
Red	Power	12V (automotive)	4

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7.2 Interface Cables

The following adaptor cables are available from Tallysman:

7.2.1 **DB9 test cable:**

The 27-0047-0 adaptor cable is required to connect the TW5210 to a PC DB9 port and for configuring the operating parameters.

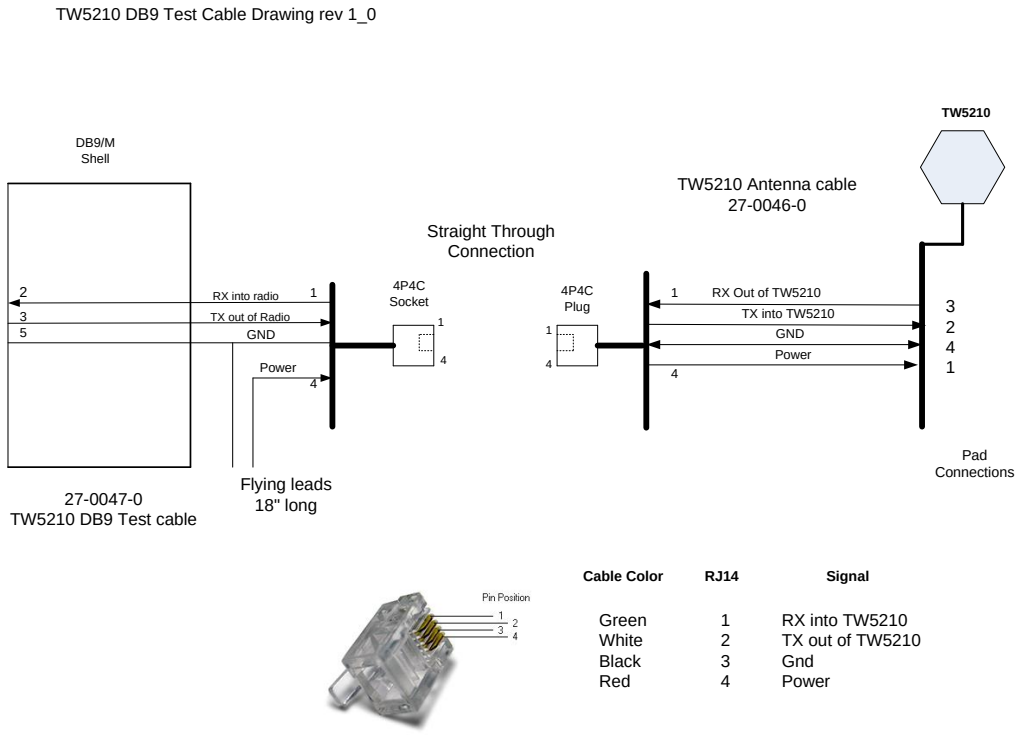

Figure 24

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7.2.2 **Tait 8000 Series radio:**

The 27-0048-0 adaptor cable is required to connect the TW5210 to a Tait 8000 series radio.

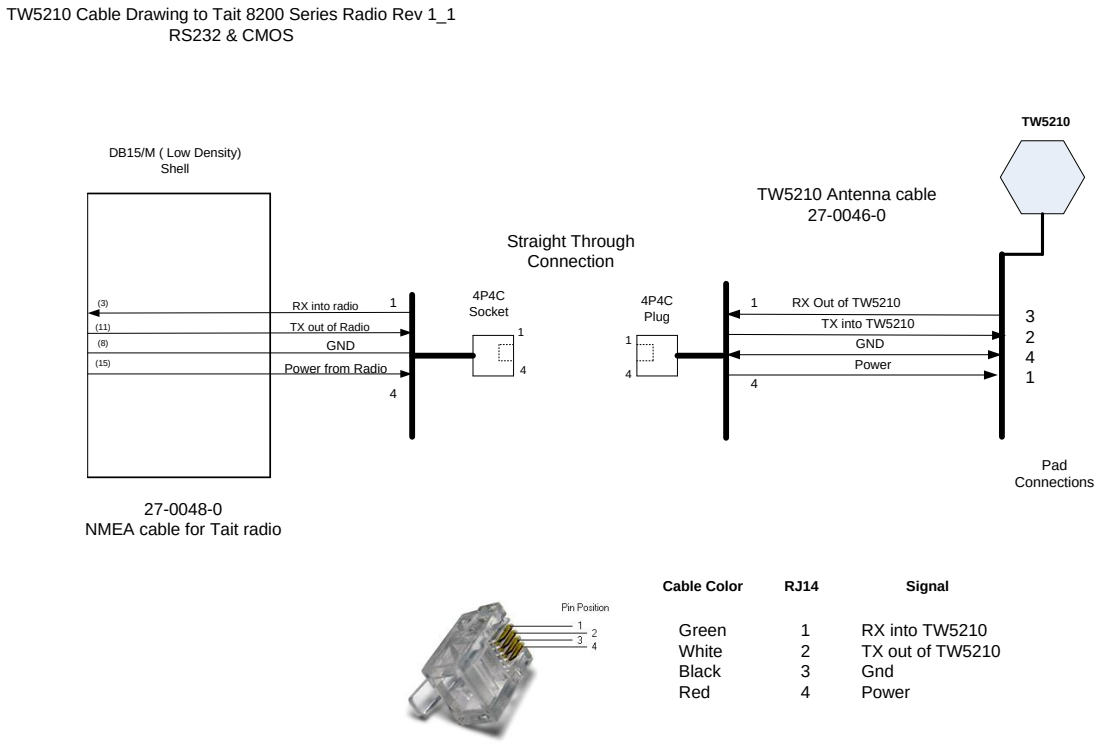

Figure 25

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7.2.3 **Kenwood NEXEDGE Radio**

The 27-0036-1-0 adaptor cable is required to connect the TW5210 to a Kenwood NEXEDGE radio.

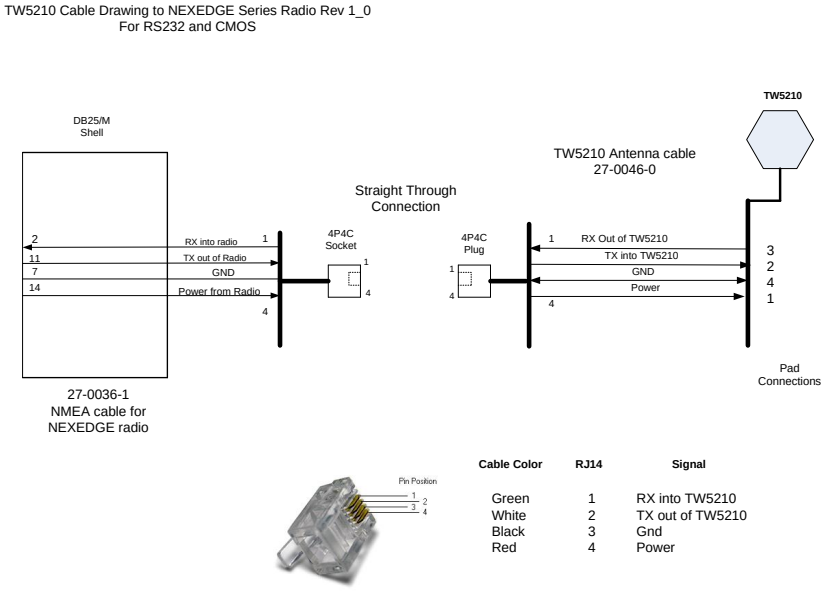

Figure 26

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8 NMEA Message Reference

NMEA 0183 sentences are all ASCII. Each sentence begins with a dollar sign ($) and ends with a carriage return linefeed (<CR><LF>). Data is comma delimited. A checksum is optionally added.

The following format indicate 5 digit RMC and GGA outputs.

8.1 NMEA Field Types

NMEA message fields have the following format:

Status:	A	Yes/Data valid
	V	No/Data invalid
‡ Latitude:	llll.lllll	ddmm.mmmmm
‡ Longitude:	yyyyy.yyyyyy	dddmm.mmmmm
Time:	hhmmmsslss	HoursMinutesSeconds.decimalSeconds
Defined Fields:	Predefined Constants, most often alpha characters	
Numeric Numbers:	x.x	Digit.decimalDigit
Fixed Hex Fields	hh__	MSB to the left

Information fields:

c---c Variable length Character fields

aa__Fixed Length alpha fields

xx__Fixed Length numeric characters

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cc__fix length of valid characters

Spaces are only used in variable text fields.

Negative values are indicated by the first character in the field.

Please see the full NMEA 0183 Specification for a full description of the message field formats.

ǂ Note: The number of decimal digits output on RMC and GGA is configurable i.e. 3,4 or 5

8.1.1 **RMC**

The RMC message is the recommended minimum data for GPS

$GPRMC,hhmmss.ss,a,llll.llll,a,yyyyy.yyyyy,a,x.x,x.x,ddmmyy,x.x,a*hh

RMC= Recommended Minimum Specific GPS/TRANSIT Data

*$GPRMC,204804.000,V,4520.254,N,07554.206,W,0.0,0.0,200608,0.0,W*7E*

The following fields are listed in the order shown in the comma-separated sentence.

1 = UTC of position fix

2 = Data status (A= Data valid, V=navigation receiver warning)

3 = Latitude of fix

4 = N or S

5 = Longitude of fix

6 = E or W

7 = Speed over ground in knots

8 = Track made good in degrees true

9 = UT date

10 = Magnetic variation degrees (Easterly var. subtracts from true course)

11 = E or W

12 = Checksum

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Note: The number of

8.1.2 **GGA**

The GGA message provides Fix Information.

$GPGGA,hhmmss.sss,llll.llllll,a,yyyyy.yyyyy,a,x,xx,xx.x,xxx.xx,M,xx.x,M,x.x,xxxx*hh

GGA = Global Positioning System Fix Data

*$GPGGA,204804.000,4520.25363,N,07554.20602,W,0,00,99.0,087.54,M,-34.4,M,,*62*

The following fields are listed in the order shown in the comma-separated sentence.

1 = UTC of Position

2 = Latitude

3 = N or S

4 = Longitude

5 = E or W

6 = GPS quality indicator (0=invalid; 1=GPS fix; 2=Diff. GPS fix)

7 = Number of satellites in use [not those in view]

8 = Horizontal dilution of position

9 = Antenna altitude above/below mean sea level (geoid)

‡ 10 = Meters (Antenna height unit)

11 = Checksum

11 = Geoidal separation (Diff. Between WGS-84 earth ellipsoid and mean sea level.-=geoid is below WGS-84 ellipsoid)

12 = Meters (Units of geoidal separation)

13 = Age in seconds since last update from diff. Reference station

14 = Diff. Reference station ID#

15 = Checksum

‡ Note: If 4 or 5 digit GGA is configured the Meters output will be 2 digits. If 3 digit GGA is configured the Meters output will be 1 digit.

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8.1.3 **GSA**

The GSA message provides overall satellite data

$GPGSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx.x,xx.x,xx.x*hh

GSA = GPS receiver operating mode, SVs used for navigation, and DOP values.

*$GPGSA,A,1,,,,,,,,,,,,,99.0,99.0,99.0*00*

The following fields are listed in the order shown in the comma-separated sentence.

1 = Mode:

M=Manual, forced to operate in 2D or 3D

A=Automatic, 3D/2D

2 = Mode:

1=Fix not available

2=2D

3=3D

3-14 = Ids of SVs used in position fix (null for unused fields)

15 = PDOP

16 = HDOP

17 = VDOP

18 = Checksum

8.1.4 **GSV**

The GSV message provides detailed satellite data.

$GPGSV,x,x,xx,xx,xx,xxx,xx,……..xx,xx,xxx,xx*hh

GS = Number of SVs in view, PRN numbers, elevation, azimuth & SNR values.

*$GPGSV,3,1,11,03,12,174,,06,20,159,,13,14,315,,14,02,139,*7C*

1 = Total number of messages of this type in this cycle
2 = Message number
3 = Total number of SVs in view
4 = SV PRN number

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5 = Elevation in degrees, 90 maximum
6 = Azimuth, degrees from true north, 000 to 359
7 = SNR, 00-99 dB (null when not tracking)
8-11 = Information about second SV, same as field 4-7
12-15 = Information about third SV, same as field 4-7
16-19 = Information about fourth SV, same as field 4-7
20 = Checksum

8.1.5 **VTG**

The VTG message provides vector track and speed over ground

$GPVTG,hhh.hh,a,hhh.hh,a,x.xx,a,xx.x,a*hh

VT = Course over Ground and Ground Speed.

*$GPVTG,0.0,T,,M,0.0,N,0.0,K*60*

1 = Measured heading
2 = reference (True)
3 = Measure heading
4 = reference (Magnetic)
5 = Horizontal speed (knots)
6 = Units (knots)
7 = Horizontal speed (km/hour)
8 = Units (km/hr)
9 = Checksum
16-19 = Information about fourth SV, same as field 4-7
20 = Checksum

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